INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
Exp. Date (11/30/2010)
Form No. (10-226)

Reporting Year:	**Park:**	**Select the type of permit this report addresses:**
2008	Shenandoah NP	Scientific Study

Name of principal investigator or responsible official:	**Office Phone:**
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Project Title (maximum 300 characters):

Biological significance of headwater streams and springs in Shenandoah National Park.

Park-assigned Study or Activity #:	**Park-assigned Permit #:**	**Permit Start Date:**	**Permit Expiration Date:**
SHEN-00334	SHEN-2007-SCI-0003	Mar 26, 2007	Sep 30, 2010

Scientific Study Starting Date:	**Estimated Scientific Study Ending Date:**
Mar 26, 2007	Sep 30, 2010

For either a Scientific Study or a Science Education Activity, the status is:

Continuing

For a Scientific Study that is completed, please check each of the following that applies:

__ A final report has been provided to the park or will be provided to the park within the next two years

__ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park

__ All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed

Activity Type:

Research

Subject/Discipline:

Water Resources

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

The goal of this project is to characterize the physical, chemical, and biological characteristics of headwater streams and small springs or groundwater seeps in SHEN. This goal will expand the water resource inventory and monitoring programs in SHEN from the lower stream reaches in the park to include important water resources further upstream in the headwater portion of individual watersheds. The specific objectives are:

(1) Determine the relationship between landscape setting and the physical, chemical and biological characteristics of headwater streams and springs or groundwater seeps in SHEN.

(2) Determine the extent to which the current water resources monitoring program (which is focused on larger, lower elevation stream sites) is representative of the range of aquatic habitat conditions in the park.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

Progress to date:

Previous years:

1) We conducted landscape analyses during the winter of 2006-2007 to use as the basis for sample site selection. For streams, we used hydrologic modeling to identify all stream site locations in the park that drain 100-ha (+/- 5-ha) of land. We selected a 100-ha basin size because it approximates the smallest streams with permanent flow in SHEN. Subsequently, we used GIS to overlay maps of land cover, topography, and geology to characterize the landscape setting within the drainage area for each potential stream site. We then used stratified random approach to select sites for sampling water chemistry and aquatic macroinvertebrates that represented distinct elevation and bedrock geology classes present in the park. We used essentially the same methodology for selecting springs for sampling except that we used maps that depict known locations of springs as a base map. These maps of spring locations in combination with landscape attributes near spring sites and existing water chemistry data were used to select a subset of available spring sites that reflect park-wide variation.

2) We collected both high-flow (May-June. 2007) and base-flow (Sept-Oct, 2007) water chemistry samples and discharge measurements from 32 headwater stream sites. Discharge measurements were obtained by dilution gauging and water chemistry parameters measured included temperature, specific conductivity, pH, acid neutralizing capacitiy, major anions and cations, silica, and aluminum (for samples with pH less than 6.0). We also collected aquatic macroinvertebrate samples (N = 3 Surber samples per site) and conducted habitat assessments at the 32 headwater stream sites (June, 2007). Habitat assessments included information on canopy cover, stream depth profiles, substrate types, and a large woody debris census.

3) We collected base-flow (Oct., 2007) water chemistry samples, conducted habitat assessments, and obtained discharge measurements at 33 springs. We also conducted high-flow sampling for aquatic macroinvertebrates, water chemistry samples and discharge measurements from springs in April 2008.

Current Year:

4) All water chemistry samples collected have been analyzed in the lab. All discharge measurements have been analyzed and summarized. Macroinvertebrates have been picked from all samples and taxonomic identification of specimens from stream samples has begun.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):	**Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):**
$7500	$138000

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:

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collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.